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(19) THE PATENT OFFICE LONDON

(54) LOOP DRIVEN VEHICLES

71) We, NORTON VILLIERS LIMITED, a British Company of Marston Road, Wolverhampton in the County of Stafford, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to chain driven vehicles and is particularly applicable to motor cycles. The invention concerns the mounting of a power unit in the frame of a loop or chain driven vehicle and provides several modifications of the arrangement described in our Complete Specification No. 1,219,896.

According to one aspect of the invention we provide a vehicle comprising a frame; a power unit movably mounted on the frame but having a neutral position relative thereto; a fork pivotally mounted on the power unit; a driving wheel rotatably mounted in the fork; a driving loop interconnecting the driving wheel and the power unit; and three mountings between the power unit and the frame; the mountings being located respectively at the apices of a triangle lying in a plane perpendicular to the axis of rotation of the driving wheel, each of the mountings comprising a first rigid mounting element fixed to the power unit and a second rigid mounting element fixed to the frame, each element providing two oppositely directed faces, the faces of the element of each mounting being arranged in two pairs, each pair comprising one face from each element with the faces of each pair facing one another, and a mass of resilient material interposed between and secured to each pair of faces; the mountings controlling movement of the power unit relative to the frame so that the permitted amplitude of such movement in first direction radial to the axis is a number of times greater than the permitted amplitude of such movement in second directions parallel to said axis.

Preferably the resilient material which is interposed between the faces is arranged so that the material is in shear during relative movement between the power unit and the frame in said first directions but is in compression during relative movement in said second directions.

Preferably, the faces lie in planes normal to the axis. Each mounting may comprise several pairs of faces with a mass of resilient material between and secured to the faces of each pair of adjacent faces. Each mass may be pre-loaded so as to be compressed in said second directions which increase the compliance and thus the permitted amplitude of movement in said first directions and reduces the compliance and thus the permitted amplitude of movement in said second directions.

According to another aspect of the invention we provide a vehicle comprising a frame; a power unit movably mounted on the frame but having a neutral position relative thereto; a fork pivotally mounted on the power unit; a driving wheel rotatably mounted in the fork; a driving loop interconnecting the driving wheel and the power unit; and three mountings between the power unit and the frame: the mountings being located respectively at the apices of a triangle lying in a plane perpendicular to the axis of rotation of the driving wheel, each of the mountings comprising a first mounting element in the form of a tubular assembly having oppositely directed faces at the end thereof and fixed to one of the power units and the frame; a second rigid mounting element in the form of a shaft passing through said tubular assembly and carrying abutment plates at the ends thereof, which plates provide oppositely directed faces, fixed to the other of the

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power units and the frame, the faces of the elements of each mounting being arranged in two pairs, each pair comprising one face from each element with the faces of each pair facing one another, and a thrust member of bearing material interposed between each pair of faces; each mounting including a mass of resilient material in the form of bush means within the tubular assembly and surrounding the shaft, the mountings controlling movement of the power unit relative to the frame so that the permitted amplitude of such movement in first directions radial to the axis is controlled by deformation of the resilient material and is a number of times greater than the permitted amplitude of such movement in second directions parallel to the said axis which latter amplitude is controlled by said bearing material.

We have found that if the mountings at the apices of the triangle are of the form set forth above then a useful mounting is obtained.

According to a third aspect of the invention, we provide a vehicle comprising a frame, a power unit movably mounted on the frame but having a neutral position relative thereto; a fork pivotally mounted on the power unit; a driving wheel rotatably mounted in the fork; a driving loop interconnecting the driving wheel and the power unit; and three mountings between the power unit and the frame; the mountings being located respectively at the apices of a triangle lying in a plane perpendicular to the axis of rotation of the driving wheel, each of the mountings comprising a first rigid mounting element fixed to the power unit and a second rigid mounting element fixed to the frame; each element of one of the mountings providing two oppositely directed faces, the faces of the elements of such mounting being arranged in two pairs, each pair comprising one face from each element with the faces of each pair facing one another, and a thrust member of bearing material interposed between each pair of faces; each mounting of the other two mountings including a mass of resilient material interposed between the elements; the mountings controlling movement of the power unit relative to the frame so that the permitted amplitude of such movement in first directions radial to the axis is controlled by deformation of the resilient material and is a number of times greater than the permitted amplitude of such movement in second directions parallel to said axis which latter amplitude is at least partly controlled by said bearing material.

Thus we have found that it is in many cases sufficient if the power unit is supported from the frame at two positions at the apices of said triangle while a guide is provided at the third apex (i.e. said one mounting) which prevents the power unit twisting relative to said axes, i.e. guides the power unit for movement perpendicular to said axis but does not resiliently support it.

The elements of each said other mounting may have generally parallel faces between which is interposed the mass of resilient material which is bonded to the faces. Alternatively, the elements of each said other mounting may present concentric, spaced apart faces with the resilient material interposed between said faces. In a further arrangement one of the said other mountings may be such as to provide parallel faces between and to which said mass of resilient material is interposed and bonded and the other of said mountings may have concentric spaced apart faces between which said mass of resilient material is interposed.

The mounting which merely provides said guide can be of any of the apices of the triangle but is preferably located at the apex nearest to the driven wheel.

According to a fourth aspect of the invention, we provide a vehicle comprising a frame; a power unit movably mounted on the frame but having a neutral position relative thereto; a fork pivotally mounted on the power unit; a driving wheel rotatably mounted in the fork; a driving loop interconnecting the driving wheel and the power unit; and three mountings between the power unit and the frame; the mountings being located respectively at the apices of a triangle lying in a plane perpendicular to the axis of rotation of the driving wheel, and being arranged at parts of the frame which are rigidly interconnected as hereinafter defined, the mountings controlling movement of the power unit relative to the frame so that the permitted amplitude of such movement in first directions radial to the axis is a number of times greater than the permitted amplitude of such movement in second directions parallel to said axis.

All three mountings may support the power unit or two of the mountings may support the power unit while the third merely provides a guide for movement of the power unit relative to the frame in said first directions.

When we say that said parts are "rigidly interconnected" we mean that the parts are either:—

1. On a rigid frame backbone or supported by substantially straight, triangulated links secured to the backbone, or

2. On a sheet metal frame so constructed that the apices are prevented from moving relative to each other in said plane.

It has been common in the past to have bent tubes in a tubular motor cycle frame

and to have at least one of the power unit mountings supported from said bent tubes. We have found that such bent tubes tend to deflect under extreme loads and as a result there can be a disadvantageous effect on the motor cycle handling, particularly where the swinging fork is pivotally mounted on the power unit. The power unit may twist about a vertical axis and thus allow the driven wheel to twist about said axis thus affecting the handling characteristics.

In one arrangement according to this aspect of the invention, two of the mountings are located adjacent opposite ends of a rigid frame backbone or of an upper part of the frame and a link depends from one of these mountings to the lower part of the power unit to which the link is rigidly attached.

Each of the mountings may resiliently support the power unit and may be of either of the types mentioned above i.e. mountings having elements which provide flat faces between which a mass of resilient material is interposed and to which faces the material is bonded or mountings in which the elements provide concentric surfaces between which the mass of resilient material is interposed. Alternatively, two of the mountings may resiliently support the engine and the third comprise a guide as described above. In this arrangement, the guide may conveniently be a mounting from which the link depends to the lower part of the power unit. It is not necessary that the mountings which resiliently support the power unit in the frame be all of the same construction, some can be of the type having parallel faces and some of the type having concentric faces.

The invention will now be described in detail by way of example with reference to the accompanying drawings in which:—

FIGURE 1 is a perspective view of a motor cycle constituting a first embodiment of the invention;

FIGURE 2 is a cross-section through a first form of mounting for the power unit of the motor cycle of Figure 1;

FIGURE 3 is a section through a second form of mounting unit for a power unit of the motor cycle of Figure 1;

FIGURE 4 is a partial section through a third type of mounting for the power unit of the motor cycle of Figure 1;

FIGURE 5 is a sectional view through a fourth type of mounting for the power unit of the motor cycle of Figure 1;

Figure 6 is a perspective view of a motor cycle constituting a second embodiment of the invention; and

FIGURE 7 is a perspective view of a fifth type of mounting for the power unit of the motor cycle of Figure 1 or Figure 6.

Referring now to Figure 1 this shows a motor cycle having a frame indicated generally at 10. The frame is in many respects similar to that described in Complete Specification No. 1,219,753. The main difference between the frame shown in Figure 1 and that described in the above mentioned complete specification is that the tubes which were provided in the previous arrangement to support the engine have been dispensed with and the engine is supporated solely from the rigid, triangulated frame.

It has been common in the past to have bent tubes in a tubular motor cycle frame and to have at least one of the power unit mountings supported from said bent tubes as described in said specification. We have found, however, that such bent tubes tend to deflect under extreme loads and as a result there can be a disadvantageous effect on the motor cycle handling, particularly where the swinging fork which carries the rear road wheel is pivotally mounted on the power unit. The power unit may twist about a vertical axis and thus allow the driven wheel to twist about said axis thus affecting handling characteristics. As will be described in detail below, the power unit of the present invention is preferably mounted directly from the rigid part of the frame and thus does not rely for its location on any bent tubes.

The frame shown in Figure 1 comprises a backbone 11 having a support 12 at its front end which pivotally support the front fork 13 in which is mounted the front road wheel 14. Secured to the backbone 11 approximately half way along the backbone are two straight tubes 15 which at their upper ends are rigidly secured to the backbone through bent portions 16 and gussets 17. It will be seen that the tubes are straight up to the gussets 17 and are thus rigidly connected to the backbone 11 and cannot move relative thereto.

There is a second pair of tubes at the rear end of the backbone of which one tube 18 is shown and is gusseted at its upper end at 19 to the backbone and is thus rigidly secured to the backbone. On each side of the frame, the tubes 15 and 18 are joined at a junction 20. It will be appreciated, therefore that the backbone 11 and the tubes 15 and 18 form a rigid triangulated structure from which the power unit may be supported and that there is no danger of this frame unit deflecting under extreme load because of its triangulated construction. Further details of the precise construction of the frame can be obtained from Complete Specification No. 1,219,753.

A power unit for the motor cycle is indicated generally at 21 and in the example

shown comprises a unitary engine and gearbox, the engine having a cylinder block 22 carrying a carburettor 23 and an exhaust pipe 24. The rear road or driving wheel is indicated at 25 and is rotatably mounted about an axis 26 in a fork 27 which is pivotally mounted at 28 to the power unit 21. The wheel 25 is drivingly connected with the power unit through a chain 29 but this chain could be replaced by some other form of driving loop such as an internally toothed belt. Conventional springing means 30 are interposed between the fork 27 and the frame 10.

The power unit is mounted on the frame by three mountings indicated at 31, 32 and 33 respectively. These mountings are located at the apices of a triangle lying in a plane perpendicular to the rotary axis 26 of the driving wheel 25. The mounting 33 is connected to the power unit through a rigid link 34 which is at its lower end rigidly connected to the power unit. By the use of such a link, both of the mountings 31 and 33 can be anchored to the backbone 11 while the other mounting 32 is anchored to the frame adjacent to the junctions 20 so that each of the three mountings is rigidly located relative to the other two mountings on the rigid frame and it will be seen that no bent tubes are used to locate or support the engine as is described in said Complete Specification No. 1,219,753.

The construction of the mountings 31, 32 and 33 will now be described. Referring now to Figure 2, this shows the mounting 31 which comprises an element in the form of a tubular assembly 35 comprising a mounting sleeve 36 which is welded to plates 37 which in turn are welded to the backbone 11. At its ends, the mounting sleeve 35 carries thrust plates 38 which provide outwardly directed faces 39.

A bracket is secured to the cylinder block 22 and comprises two plates 40 between which is secured a shaft 41. The shaft 41 carries thrust plates 42 and these thrust plates provide inwardly directed surfaces 43. Between each pair of surfaces 39 and 43 is interposed a washer of bearing material 44. Seals 45 seal the ends of the tubular assembly.

Bushes 46 of resilient material are interposed between the shaft 41 and the sleeve 36 and each bush of resilient material is bonded to inner and outer metal sleeves which engage the shaft 41 and mounting sleeve 36 respectively. Two further resilient bushes 47 are provided surrounding the shaft and of lesser diameter than the bushes 46. It will be noted that the longitudinal axis of the shaft 41 is parallel to the rotary axis 26 of the driving wheel 25.

The mounting 33 shown in Figure 3 is similar to the mounting 31 except that it is shorter and does not have the resilient bushes such as 46 and 47. Thus the mounting 33 comprises plates 48 which are welded to the backbone 11 and which carry a mounting sleeve 49 forming part of a tubular assembly 50. The tubular assembly also includes thrust plates 51 which have outwardly directed surfaces 52. The link 34 comprises spaced lugs 53 between which extends a shaft 54 carrying nuts 55 at its ends. The shaft 54 carries thrust plates 56 and these thrust plates provide inwardly directed faces 57. Between each pair of faces 52 and 57 is a washer 58 of bearing material. Seals 59 seal the ends of the mounting.

The mounting 32 is in all respects similar to the mounting 31 and is interposed between the power unit and the junctions 20 of the tubes 15 and 18.

Movement of the power unit in the frame in directions perpendicular to the rotary axis 26 is controlled by compression of the resilient bushes 46 in the mountings 31 and 32 and, under extreme deflections, by the compression of the bushes 47. Movement of the power unit 21 parallel to the rotary axis 26 is controlled by the clearance between the washer 44 or 58 of bearing material and the faces of each opposed pair of faces such as 39 and 43 for the mountings 31 and 32 and the faces 52 and 57 for the mounting 33. The movement of the power unit relative to the frame in directions parallel to the axis 26 is thus limited positively by the engagement of the faces of each opposed pair with the washer of bearing material between the faces of the pair. This positive limitation on movement of the power unit parallel to the axis 26, therefore, locates the power unit positively in this direction. The amplitude of the permitted movement of the power unit from a neutral position in directions parallel to the axis 26 is a number of times less than the amplitude of the permitted movement from said neutral position in directions perpendicular to the axis, such movements perpendicular to the axis being controlled by the compression of the resilient bushes 46 and 47. In other words, the power unit can oscillate substantially in planes perpendicular to the axis 26 with a relatively high amplitude and this does not affect the handling characteristics of the motor cycle but the power unit has a relatively lower permitted amplitude of movement in directions parallel to the axis 26 since such movement does adversely affect the handling characteristics of the motor cycle due to the fact that the driving wheel 25 is pivotally mounted on the power unit 21.

In a modified arrangement, the mounting 33 could be similar to the mounting 31 except that it could be shorter, in other words therewould be resilient bushes such as 46 between the shaft 54 and the mounting sleeve 50.

Referring now to Figure 4 this shows in part a modification of a mounting such as 31. The modified mounting comprises a tubular assembly indicated generally at 60 and comprising a mounting sleeve 61 which at its ends carries thrust plates 62, the thrust plates providing outwardly directed surfaces 63. A shaft 64 passes through the tubular assembly and carries thrust plates 65 having inwardly directed surfaces 66. The shaft is secured to the frame or power unit through plates 67 and the mounting sleeve 61 is secured to the power unit or frame through mounting plates, not shown. The shaft 64 carries resilient bushes 68 which operate in the same manner as the bushes 46 in Figure 2.

Interposed between each pair of faces 63 and 66 there is a block of resilient polyurethane material 69 which had been compressed between the faces 63 and 66 so that it is substantially solid in directions perpendicular to said faces thus positively locating the tubular assembly 60 and the shaft 64 relative to one another in directions parallel to the longitudinal axis of the shaft 64 i.e. parallel to the rotary axis 26 of the rear road wheel. The block of material 69 has a plurality of radially directed holes 70 therein. It is known that when a resilient material is compressed strongly in one direction the capacity of the material to resist shear stresses in a perpendicular direction is reduced. Thus the blocks 69 have the property of limiting virtually positively the endwise movement of the shaft 64 relative to the mounting sleeve 61 while allowing relative movement of the shaft 64 within the sleeve 61 in radial directions. The resulting structure therefore functions substantially as does the structure of the mounting 31.

The mountings 31 and 32 may be replaced with mountings modified as described in relation to Figure 4 and the mounting 33 may be similar to the mountings 31 and 32 or it may be as described in relation to Figure 3 except that blocks of resilient material such as 69 take the place of the washers 58.

Figure 5 illustrates a modification of a mounting such as 33 and, referring to that figure, the backbone 11 carries a bracket 71 having parallel faces 72. The upper end of a link similar to the link 34 is indicated at 73 and bolted to the end of the link are plates 74 which carry pads 75 of nylon or similar material having faces 76 which are parallel to, and slightly spaced from, the faces 72.

It will be seen that the mounting of Figure 5 controls movement of the power unit in directions parallel to the axis 26 without restraining movement in directions perpendicular to the axis.

Figure 6 shows a motor cycle similar to that of Figure 1 except that in place of the triangulated frame 10 there is a sheet metal frame indicated generally at 77. Thus this frame carries a front fork 78 with the front road wheel 79 and also the power unit 80 which in turn carries the rear road wheel 81 through a pivoted fork 82, the wheel being driven by a chain 83. The power unit 80 is mounted on the frame by three mountings 84, 85 and 86. The mountings 84 and 85 are of the construction described in relation to Figure 2 and the mounting 86 is of the construction described in relation to Figure 3. A link 87 extends from the mounting 86 and is rigidly secured to the power unit 80.

The frame is generally of box construction, having an upper part 88, side plates 89 and front and rear plates 90 and 91. It will thus be seen that the frame is substantially in the form of a box girder and the link 87 passes into the box girder frame and is secured to a bracket 92 provided therein. Since the frame is of box girder construction, the points at which the mountings 84, 85 and 86 are secured are rigidly interconnected and therefore cannot move relative to one another even in extreme stress so that even with a very high speed racing motor cycle the attachment points of the mountings 84, 85 and 86 to the frame do not move relative to one another under stress and thus the handling of the motor cycle is improved.

We have found that by positively limiting the movement of the power unit relative to the frame in directions parallel to the axis 26 at all three mountings, very advantageous results are obtained and that these results are improved further where, as is preferred, the mountings are located on a triangulated tubular frame as described in Figure 1 or a box section sheet metal frame as described in relation to Figure 5 and the mountings are prevented from moving relative to one another under the extreme stresses which occur during the operation of high speed racing motor cycles.

Another, but less preferred, form of resilient mounting is shown in Figure 7. The mounting comprises a first element 100 which is arranged to be secured to the frame of the motor cycle and a second element 101 to be secured to the power unit. The element 100 is of substantially U-shape and has a pair of inwardly directed faces one of which is shown at

102 and a pair of outwardly directed faces one of which is shown at 103. The element 101 is of generally E-shape and has three lugs 104, 105, and 106. The lug 105 is received within the limbs of the bracket 100 and has oppositely directed faces. Between each face of the lug 105 and one of the faces 102 there is received a disc like mass of resilient material 107. These masses are bonded to the faces 102 and the faces of the lug 105 and are preloaded in a direction along the line 108. In a similar manner, between each outwardly directed surface 103 of the U-shaped element 100 and the inwardly directed faces of the lugs 104 and 106 there are inserted disc like masses of resilient material 109 and 110 respectively. These masses are bonded to the faces between which they are interposed. The resilient material may, for example, be rubber or polyurethane.

Each mass of resilient material 107, 109 and 110 is arranged so that its compliance in directions along the line 108 is less than the compliance in directions perpendicular to the line 108. The line 108 is arranged to be parallel to the rotary axis of the driven wheel.

Mountings such as shown in Figure 7 may be arranged at all the mounting points or at two mounting points with a guide such as shown in Figure 3 or Figure 5 at the other mounting point. If desired, a mounting such as shown in Figure 7 may take the place of one of the mountings of the form shown in Figures 2 and 4.

The invention has been specifically described in relation to motor cycles but it may also be applied to other two wheeled steerable vehicles and the engine mounting systems described could also be applied to snowmobiles in which case the driven wheel 25 would drive the track of the snowmobile.

WHAT WE CLAIM IS:—

1. A vehicle comprising: a frame; a power unit movably mounted on the frame but having a neutral position relative thereto; a fork pivotally mounted on the power unit; a driving wheel rotatably mounted in the fork; a driving loop interconnecting the driving wheel and the power unit; and three mountings between the power unit and the frame; the mountings being located respectively at the apices of a triangle lying in a plane perpendicular to the axis of rotation of the driving wheel, each of the mountings comprising a first rigid mounting element fixed to the power unit and a second rigid mounting element fixed to the frame, each element providing two oppositely directed faces, the faces of the elements of each mounting being arranged in two pairs, each pair comprising one face from each element with the faces of each pair facing one another, and a mass of resilient material interposed between and secured to each pair of faces; the mountings controlling movement of the power unit relative to the frame so that the permitted amplitude of such movement in first directions radial to the axis is a number of times greater than the permitted amplitude of such movement in second directions parallel to said axis.

2. A vehicle according to Claim 1 wherein the resilient material which is interposed between the faces is arranged so that the material is in shear during relative movements between the power unit and the frame in said first directions but is in compression during relative movement in said second directions.

3. A vehicle according to Claim 1 or Claim 2 wherein each mounting comprises several pairs of faces with a mass of resilient material between and secured to the faces of each pair of adjacent faces.

4. A vehicle according to any preceding claim wherein each mass is pre-loaded so as to be compressed in said second directions.

5. A vehicle comprising: a frame; a power unit movably mounted on the frame but having a neutral position relative thereto a fork pivotally mounted on the power unit; a driving wheel rotatably mounted in the fork; a driving loop interconnecting the driving wheel and the power unit and three mountings between the power unit and the frame the mountings being located respectively at the apices of a triangle lying in a plane perpendicular to the axis of rotation of the driving wheel, each of the mountings comprising a first rigid mounting element in the form of a tubular assembly having oppositely directed faces at the ends thereof and fixed to one of the power units and the frame, a second rigid mounting element in the form of a shaft passing through said tubular assembly and carrying abutment plate at the ends thereof, which plates provide oppositely directed faces, fixed to the other of the power unit and the frame, the faces of the elements of each mounting being arranged in two pairs, each pair comprising one face from each element with the faces of each pair facing one another, and a thrust member of bearing material interposed between each pair of faces, each mountings including a mass of resilient material in the form of bush means within the tubular assembly and surrounding the shaft; the mountings controlling movement of the power unit relative to the frame so that the permitted amplitude of such movement in first directions radial to the axis is controlled by deformation of the resilient material and is a number of times

greater than the permitted amplitude of such movement in second directions parallel to said axis which latter amplitude is controlled by said bearing material.

6. A vehicle comprising: a frame; a power unit movably mounted on the frame but having a neutral position relative thereto a fork pivotally mounted on the power unit; a driving wheel rotatably mounted in the fork; a driving loop interconnecting the driving wheel and the power unit; and three mountings between the power unit and the frame; the mountings being located respectively at the apices of a triangle lying in a plane perpendicular to the axis of rotation of the driving wheel, each of the mountings comprising a first rigid mounting element fixed to the power unit and a second rigid mounting element fixed to the frame; each element of one of the mountings providing two oppositely directed faces, the faces of the elements of such mounting being arranged in two pairs, each pair comprising one face from each element with the faces of each pair facing one another, and a thrust member of bearing material interposed between each pair of faces each mounting of the other two mountings including a mass of resilient material interposed between the elements, the mountings controlling movement of the power unit relative to the frame so that the permitted amplitude of such movement in first directions radial to the axis is controlled by deformation of the resilient material and is a number of times greater than the permitted amplitude of such movement in second directions parallel to said axis which latter amplitude is at least partly controlled by said bearing material.

7. A vehicle according to Claim 6 wherein at least one of said other two mountings comprises a first element in the form of a tubular assembly; a second element in the form of a shaft passing through said tubular assembly and a mass of resilient material in the form of bush means within the tubular assembly and surrounding the shaft.

8. A vehicle according to Claim 6 or Claim 7 wherein each element of said other two mountings provides two oppositely directed faces, the faces of the elements of each said other mounting being arranged in two pairs, each pair comprising one face from each element with the faces of each pair facing one another, and a thrust member of bearing material interposed between each pair of faces.

9. A vehicle according to any of Claims 6 to 8 wherein said one mounting comprises a first element in the form of a tubular assembly having said oppositely directed faces of the first element at the ends thereof; and a second element in the form of a shaft passing through said tubular assembly and carrying abutment plates to the ends thereof, which plates provide the oppositely directed faces of the second element.

10. A vehicle according to any of Claims 6 to 8 wherein the elements of the one mounting are both of U-shape, the limbs of the U of one element being parallel to the limbs of the U of the other element, said limbs providing the faces of the elements between which the bearing material is interposed.

11. A vehicle according to any of Claims 5 to 10 wherein each of at least some of said thrust members is received with clearance between the faces of a pair of faces.

12. A vehicle according to any of Claims 5 to 11 wherein each of at least some of said thrust members comprises a block of resilient material compressed between the faces of a pair of faces in a direction parallel to the longitudinal axis of the tubular assembly.

13. A vehicle according to any of Claims 6 and 7 to 12 when linked with Claim 6 wherein at least one of said other two mountings comprises a mass of resilient material interposed between and bonded to oppositely directed faces of the mounting elements.

14. A vehicle comprising a frame; a power unit movably mounted on the frame but having a neutral position relative thereto; a fork pivotally mounted on the power unit; a driving wheel rotatably mounted in the fork, a driving loop interconnecting the driving wheel and the power unit and three mountings between the power unit and the frame the mountings being located respectively at the apices of a triangle lying in a plane perpendicular to the axis of rotation of the driving wheel and being arranged at parts of the frame which are rigidly interconnected as hereinbefore defined, the mountings controlling movement of the power unit relative to the frame so that the permitted amplitude of such movement in first directions radial to the axis is a number of times greater than the permitted amplitude of such movement in second directions parallel to said axis.

15. A vehicle according to Claim 14 wherein two of the mountings are located adjacent opposite ends of a rigid frame backbone or of an upper part of the frame and a link depends from one of these mountines to the lower part of the power unit to which the link is rigidly attached.

16. A vehicle according to Claim 14 or Claim 15 wherein the vehicle comprises a frame including a straight tubular backbone having front and rear ends, first and second transversely-extending rigid attach-

ment means secured to the backbone adjacent its rear end and intermediate its ends respectively, said means projecting on both sides of the backbone, a first pair of spaced-apart substantially parallel tubes extending generally downwardly from and secured to, said first attachment means and a second pair of spaced-apart substantially parallel tubes inclined relative to the backbone and extending rearwardly from and secured to, said second attachment means, the tubes of each pair being arranged one on either side of the backbone, the tubes lying to one side of the backbone being joined and the tubes lying to the other side of the backbone being joined, all said tubes being straight between their junctions and the attachment means, one element of each of said two mountings being secured to the backbone, and one element of the third mounting being secured to the frame adjacent to the tube junctions.

17. A vehicle according to Claim 14 or Claim 15 wherein the vehicle comprises a rigid sheet metal frame and one element of each of the mountings is secured to a different part of the frame, which parts are rigidly interconnected by the frame.

18. A motor cycle substantially as hereinbefore described with reference to and as shown in Figure 1 of the accompanying drawings, the mountings for the power unit being of the form substantially as hereinbefore described with reference to and as shown in any one of Figures 2 to 5 and 7 of the accompanying drawings.

19. A motor cycle substantially as hereinbefore described with reference to and as shown in Figure 6 of the accompanying drawings, the mountings for the power unit being of the form substantially as hereinbefore described with reference to and as shown in any one of Figures 2 to 5 and 7 of the accompanying drawings.

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1356106 COMPLETE SPECIFICATION

6 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

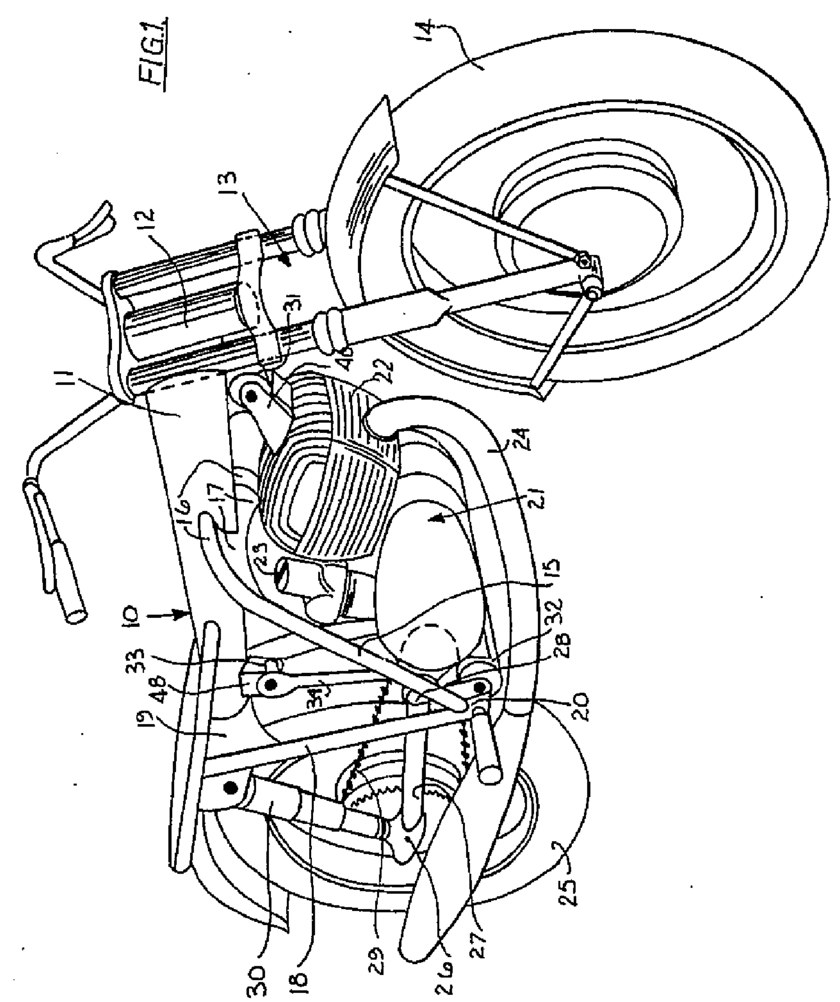

FIG.1

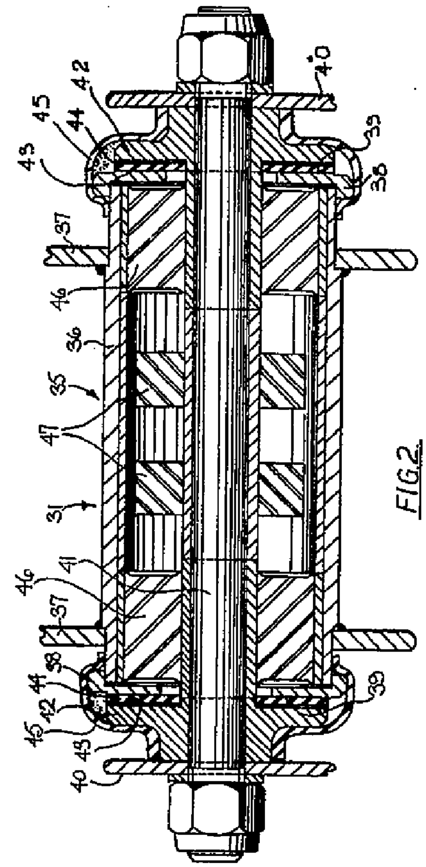

FIG.2

FIG.4.

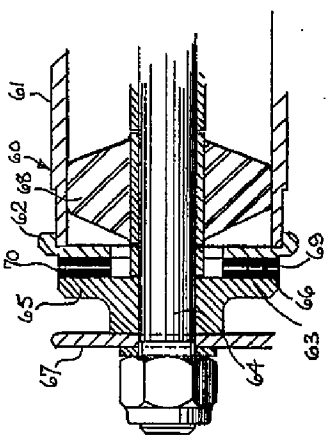
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FIG.3.

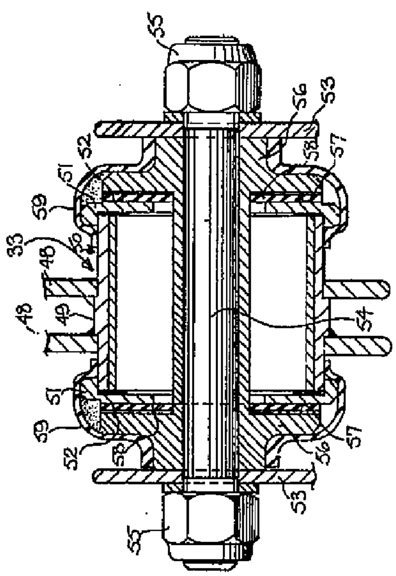
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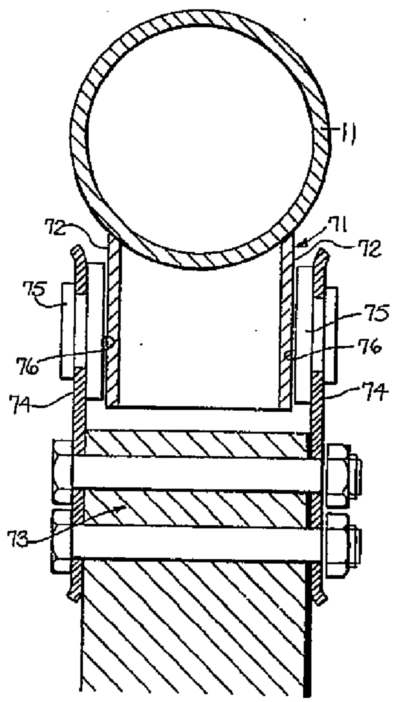
FIG.5.



1356106 COMPLETE SPECIFICATION

6 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 5

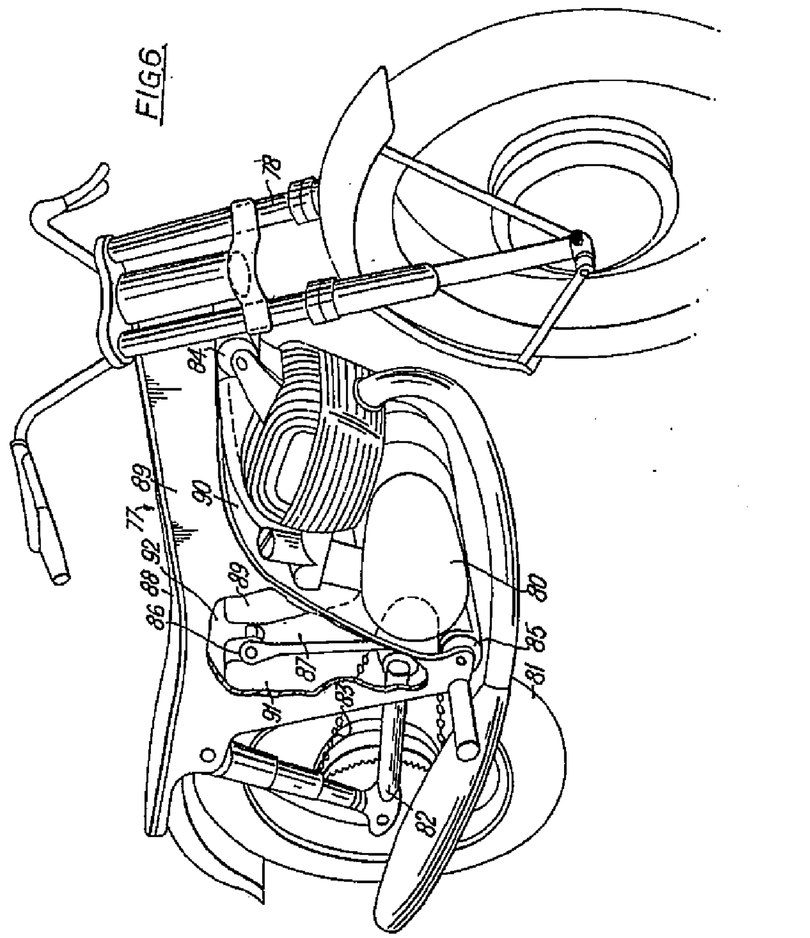


FIG6.

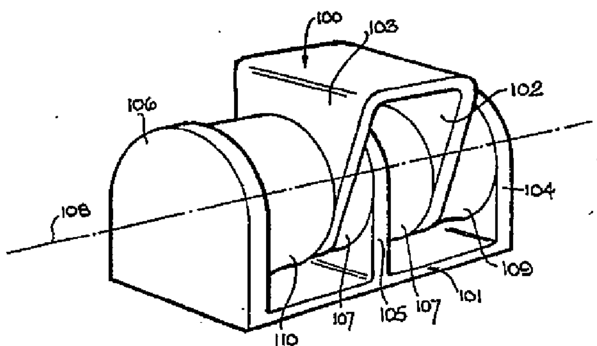


FIG. 7.